| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1(a)** | for any constant *B* | M1 |
| Applying *vu*′ + *uv′*   | M1 A1 A1 |
|  |  | **(4)** |
| **1(b)** |  Applying     | M1 A1+A1A1 |
|   | A1 |
|  |  | **(5)** |
|  |  | **(9 marks)** |
| **2(a)** |  | M1 A1 |
|  |  | **(2)** |
| **2(b)** | Applying  | M1 |
|  | oe | A2, 1, 0 |
|  |  | **(3)** |
|  |  | **(5 marks)** |
| **3(a)** |  |  |
|  | An attempts to form a single fraction | M1 |
|  | Simplifies to give a correct quadratic numerator over a correct quadratic denominator | A1 aef |
|  | An attempt to factorise a 3 term quadratic numerator | M1 |
|  |  | A1 |
|  |  | **(5)** |
| **3(b)** | f(*x*) = , *x* > 1 |  |
| f(*x*) =  |  |
|  | An attempt to form a single fraction | M1 |
|  |  |
|  | Correct result | A1 \* |
|  |  | **(2)** |
| **3(c)** | f(*x*) =  = 3(2*x* – 1)–1 |  |
|  = 3(–1) (2*x* – 1)–2 (2)  |  |
| ± *k* (2*x* – 1)–2  | M1 |
|  | A1 aef |
|  | Either  or  | A1 |
|  |  | **(3)** |
|  |  | **(9 amrks)** |
| **4(a)** |     | M1A1 |
|  |  | **(2)** |
| **4(b)** |  Uses to obtain   | M1 |
|  | B1 |
|  Uses  and  to get or in just *x*. | M1 |
|   CSO | A1\* |
|  |  | **(4)** |
| **4(c)** |   | M1A1 |
|   | dM1A1 |
|  |  | **(4)** |
|  |  | **(10 marks)** |
| **5(a)** |   | M1A1 |
|   | M1 |
|  | A1 |
|  | M1A1 |
|  |  | **(6)**  |
| **5(b)** |  At *x* = 0   | B1 |
|  Equation of normal is  or any equivalent  | M1A1 |
|  |  | **(3)** |
|  |  | **(9 marks)** |
| **6** |   … | B1 |
|  …  | M1 A1 |
| At ,  | M1 |
| leading to  Accept   | A1 |
|  |  |
| At   | M1 |
|    | A1 |
|  |  | **(7 marks)**  |
| **7(i)(a)** |  | M1A1A1 |
|  |
|  |  | **(3)** |
| **7(i)(b)** |  | B1M1A1 |
|  |  | **(3)** |
| **7(ii)** |  | M1 A1 |
|  | M1 |
| Uses and  in or to get an expression in *x* |  |
|  cso | M1 A1\* |
|  |   | **(5)** |
|  |  | **(11 marks)** |
| **8(a)(i)** |    | M1 |
|   | M1A1 |
|  |   | **(3)** |
| **8(a)(ii)** |    | M1A1 |
|    | A1 |
|  |  | **(3)**  |
| **8(b)** |   | M1A1 |
|   | M1 |
|  and    | M1A1 |
|  |  | **(5)** |
|  |  | **(11 marks)** |
| **9(a)** |   | M1A1 |
|   | M1 |
|   | A1\* |
|  |  | **(4)** |
| **9(b)** |   | M1 A1 |
|   cso | A1 |
|  |  | **(3)** |
| **9(c)** | Maximum occurs when  | M1 |
|   | A1 |
|  When  | M1 A1 |
|  Range of h(*x*) is  | A1ft |
|  |  | **(5)** |
|  |  | **(12 marks)** |
| **10(a)** |  |  |
| Apply quotient rule:  |  |
|  | Applying $\frac{vu^{'}-uv'}{v^{2}}$  | M1 |
|  | Any one term correct on the numerator  | A1 |
|  | Fully correct (unsimplified). | A1 |
|  |  |
|  | For correct proof with an understanding thatNo errors seen in working. |  |
|  (as required) | A1\* |
|  |  | **(4)** |
| **10(b)** | When ,  |  | B1 |
| At  |  | B1 |
| Either **T**:  or  and ; | with ‘their TANGENT gradient’ and their *y*1;or uses  with ‘their TANGENT gradient’; | M1 |
| **T:**  |  | A1 |
|  |  | **(4)** |
|  |  | **(8 marks)** |
| **11(a)** |   |  |
|    | Writes  as  and gives   | M1 |
|  or   | A1 |
|   | Convincing proof.Must see both  | A1 **AG** |
|  |  |  | **(3)** |
| **11(b)** |   |  |  |
|  |  | M1 |
|  | A1 |
|  |  |  | **(2)** |
| **11(c)** |  | Applies  | M1 |
|  | Substitutes  for  | M1 |
|  | Attempts to use the identity  | M1 |
| So  |  |  |
|  |  | A1 |
|  |  |  | **(4)** |
|  |  | **(9 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C3 Jan 2012 | 1 | 7.2, 7.4 | Differentiation | 1.1b |
| 2 | C3 2011 | 1 | 7.4 | Differentiation | 1.1b, 3.1a, 3.2a |
| 3 | C3 Jan 2011 | 2 | 2.6, 7.4 | Partial fractions, Differentiation | 1.1b, 2.1 |
| 4 | C3 2013 | 5 | 7.2, 7.4, 5.4, 5.5 | Differentiation and trigonometry | 1.1b, 2.1, 3.1a |
| 5 | C3 2012 | 3 | 7.2, 7.3, 7.4, 5.7 | Trigonometry, Differentiation | 1.1b, 3.1a |
| 6 | C4 2011 | 5 | 7.5 | Differentiation | 1.1b, 3.1a, 3.4 |
| 7 | C3 Jan 2013 | 5 | 7,1, 7.4, 5.5 | Differentiation | 1.1b, 2.1, 2.2a, 2.4, 3.1a, 3.4 |
| 8 | C3 2012 | 7 | 7.2, 7.4, 5.5 | Trigonometry, Differentiation | 1.1b, 3.1a |
| 9 | C3 Jan 2013 | 7 | 2.6, 2.8, 7.3, 7.4 | Algebra and functions, Differentiation | 1.1b, 3.1a |
| 10 | C3 Jan 2011 | 7 | 7.3, 7.4, 5.5 | Differentiation | 1.1b |
| 11 | C3 Jan 2011 | 8 | 7.4, 5.4, 5.5 | Differentiation, Trigonometry | 1.1b, 2.1, 2.2a |